1/16/14 - Objective: Students will prepare the Calculus BC Midterm using example problems.

Agenda

1.) Do Now
2.) Partial Fractions
3.) Midterm Review
4.) Summary

Do Now:

$$\int_0^{\frac{\pi}{4}} \frac{e^{\tan x}}{\cos^2 x}\,dx \text{ is}$$

(A) 0 (B) 1 (C) $e - 1$ (D) e (E) $e + 1$

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Study Guide for the AP Calc AB Midterm Exam

Problem	Reminders/?'s
1.) Evaluating Limits Algebraically...	

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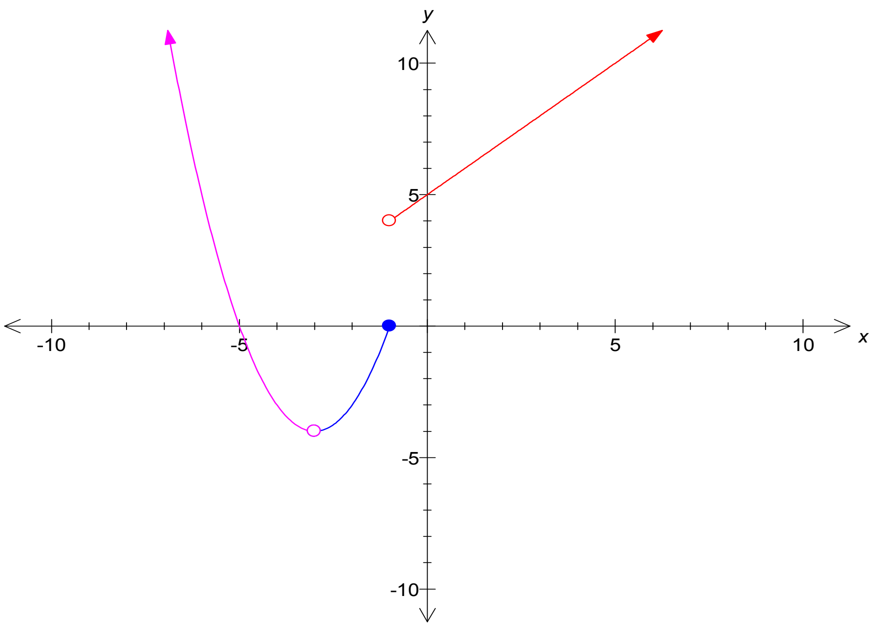
$$\lim_{x \to 5} \frac{x^2 - 25}{x - 5}$$

Sample Problems: p. 66

2.) Continuity



Is f(x) continuous @ x = -3? @ x = -1?

Sample problems: 84

3.) Intermediate Value Theorem

Show that $g(t)=\dfrac{t}{t+1}$ takes on the value 0.499 for some t in [-0 , 1].

Sample problems: p. 85, #51

4.) Definition of the Derivative

$$\boxed{f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}}$$

Evaluate: $$\lim_{h\to 0}\frac{(2+h)^3-(2)^3}{h}$$

Sample problems: p. 105

5a.) Product Rule

$$\boxed{(uv)' = uv' + u'v}$$

Evaluate the derivative of $f(x) = 3x^2 e^x$

Sample problems: p. 124

5b.) Quotient Rule

$$\boxed{\left(\frac{u}{v}\right)' = \frac{vu' - uv'}{v^2}}$$

Evaluate the derivative of $f(x) = \dfrac{\sin(x)}{x}$

Sample Problems: p. 124

6.) Chain Rule

$$\boxed{[f(g(x)]' = g'(x) \cdot f'(g(x))}$$

Evaluate the derivative of $f(x) = \tan(3x^2)$

Sample Problems: p. 153

7.) Writing and Equation for a Tangent Line

$$\boxed{y - y_1 = m(x - x_1)}$$

Write an equation for the line tangent to $f(x) = x^2 + \sin x$
@ x = 0.

Sample Problems, p. 92 #9

8.) 2nd Derivatives and Concavity

Determine the intervals on which the function is concave up and concave down:

$$f(x) = x^3 - 3x^2 - 24x + 7$$

Sample problems: p. 215

9.) Implicit Differentiation

Find slope of the tangent line to $x^3 + y^2 = 12$
@ (2 , 2)

Sample Problems: p. 162

<u>10.) Related Rates</u>

A 6 meter later is falling down a wall. The base of the ladder is moving away from the wall at .5 m/sec. How fast is the top of the ladder falling?

Sample Problems: p. 251

11.) Absolute/Local Extremes

Absolute extremes happen at endpoints & critical points. Local extremes happen at critical points.

Do a candidates test to find the maximum and minimum values of $f(x) = x^3 - 3x^2 - 24x + 7$ on [-5 , 5]

x	f(x)	max/min

Sample problems, p. 193

12.) Points of Inflection

Points of Inflection Occur where the 2nd derivative is zero and changes sign.

Find the point(s) of inflection of $f(x) = x^3 - 3x^2 - 24x + 7$

Sample Problems: p. 215

13.) Mean Value Theorem

For any contiuous and differentiable function, there exists a point "c" on the interval [a , b] where the derivative equals the slope between the endpoints.

$$\boxed{f'(c) = \frac{f(b) - f(a)}{b - a}}$$

Find a point "c" satisfying the MVT: $y = \sqrt{x} \quad on\ [4,9]$

Sample problems: p. 202

14.) Definite Integrals

Evaluate: $\int_1^4 \left(x + \frac{1}{x} \right) dx$

Sample Problems: p. 283

15.) Riemann Sums

There are 3 types of Riemann Sum: Left, Right, Midpoint and Trapezoidal

Do a Left Riemann sum with 6 equal subintervals for:

$$f(x) = 2x^2 - x + 2 \text{ on } [1\ ,\ 4]$$

Sample Problems: p. 270

16.) Fundamental Theorem of Calculus Pt. 2

There is an inverse relationship between derivatives and integrals.

$$\frac{d}{dx}\int_0^{x^3} \tan(x^2)dx =$$

Sample Problems: p. 304

17.) Integral as Net Accumulation

Water flows into an empty reservoir at a rate of 3,000 + 5t gal/hour. What is the quantity of water in the reservoir after 5 hours?

Sample problems: p. 386 #21 , 22

18.) Special Integration Techniques:

a.) u-substitution
b.) integration by parts
c.) partial fractions

Evaluate the definite integral: $$\int_0^1 \frac{x}{(x^2+1)^3}\,dx$$

Sample Problems: see recent assignments